DISCUSSION OF THE AMENDMENT

Claims 1-21 and 41-108 are active in the present application. Claims 22-40 are canceled claims. Claims 89-108 are new claims. Support for new Claims 89-99 is found in Figure 1 of the original specification. Figure 1 provides a schematic diagram of one embodiment of the adsorption heat pump of the present claims. The adsorption heat pump shown in Figure 1 includes an adsorption/desorption part that is directly connected to a condensation part (reference no. 5) and a vaporization part (reference no. 4). Because the adsorption/desorption part of Figure 1 is directly connected to a condensation part, no compression part or compressor is present between the adsorption/desorption part and the condensation part of the new claims. Likewise, because the adsorption/desorption part is directly connected to both the condensation part and a vaporization part, there is no compression part or compressor present between the adsorption/desorption part and the condensation part or vaporization part of the new dependent claims. New dependent claims 88-99 therefore exclude the presence of a compressor in certain embodiments of the invention. Support for new dependent Claims 100-108 is found at page 2, line 2 and 11-13; and page 61, line 14.

No new matter is believed to have been added by this amendment.

REMARKS

Applicants thank the Office for withdrawing the rejections of the previous Office Action. Applicants request the Office grant an interview to discuss the merits of Applicants' arguments presented herein before the mailing of any further Office Action.

The Office now rejects the claims as obvious over the combination of Hiroyuki (JP 11-223411) and Komarneni ("High Performance Nanocomposite Desiccation Materials," 1992). It appears that the Office is of the opinion that Hiroyuki discloses a heat adsorption pump that is substantially similar to the heat adsorption pump of the present claims except for the inclusion of a particular adsorbent. The Office appears to be of the belief that it would be obvious to use the adsorbent disclosed in Komarneni (e.g., SAPO-17) in the adsorption heat pump of Hiroyuki to arrive at the presently claimed invention.

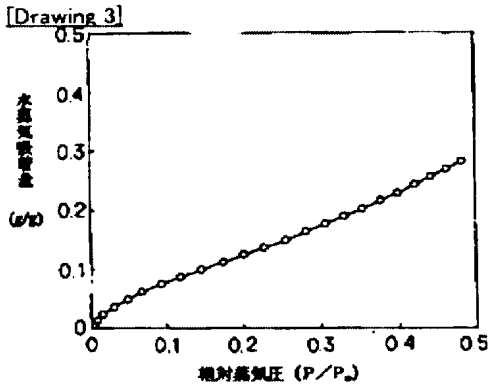
Applicants first note that the structure and mechanism of the heat adsorption pump described by Hiroyuki (see for example Figures 1 and 4 of Hiroyuki) includes a compressor such as the compressor identified as ref. no. 10 in Figure 1. The compressor is used to permit the displacement of water vapor (see paragraph [0032] of Hiroyuki). The inclusion of the compressor results in an apparatus that is complex and bulky. Figure 4 of Hiroyuki shows that two adsorption/desorption towers are needed in order to accommodate two different adsorbents. In contrast, the presently claimed invention can accomplish adsorption/desorption cycles at relatively low pressure differentials (see pages 2-3 and 5 of the present specification) without the complex apparatus required by Hiroyuki.

Applicants submit that those of ordinary skill in the art would not be motivated to use the Komarneni adsorbent in the Hiroyuki heat adsorption pump at least because the adsorption performance of the Komarneni adsorbent is substantially different from the adsorbent properties of the Hiroyuki adsorbent.

In particular, in order to run the Komarneni heat pump, four separate temperatures must be defined (see pages 18 and 19 Komarneni). This is not the case with the presently claimed invention which requires only adsorption and desorption temperatures which may be relatively close.

Hiroyuki discloses the use of silica gel as an adsorption material (see paragraph [0029] of Hiroyuki). The adsorbent of Hiroyuki has certain adsorption properties, e.g., the Hiroyuki adsorbent adsorbs predictable amounts of an adsorbate as a function of pressure. Hiroyuki provides a diagram describing the amount of adsorbate (e.g., water) that adsorbs in the Hiroyuki adsorbent as a function of relative vapor pressure ratio (i.e., P/P_o) which relates the saturation pressure of water with the pressure of water in the prior art reaction containers (see paragraphs [0029] and [0030] of Hiroyuki). Drawing 3 from Hiroyuki is reproduced below for convenience.

[Drawing 3]



It is readily evident from Drawing 3 of Hiroyuki that the amount of adsorbate which adsorbs in the Hiroyuki adsorbent, e.g., silica gel, shows a predictable almost linear relationship as a function of relative vapor pressure ratio (i.e., P/P_o).

Hiroyuki discloses that prior art heat adsorption pumps suffer from a disadvantage of requiring a substantial differential between heating and cooling temperatures (see paragraph [0005] of Hiroyuki). In order to overcome this disadvantage Hiroyuki includes a compressor in the prior art heat adsorption pump. The inclusion of the compressor makes the adsorption

and desorption of an adsorbate from the Hiroyuki adsorbent more effective at narrower temperature differentials (see paragraphs [0013] and [0024]-[0034]).

The use of compression/decompression in Hiroyuki will necessarily affect the P/P_o ratio because the saturation vapor amount of water is pressure dependent. For example, different amounts of water evaporate at different pressures and thereby the amount of water present in a saturated gas at a certain pressure will change depending on the pressure of the system, assuming that the temperature is held constant.

Applicants have disclosed a heat adsorption pump that is able to operate effectively with a narrow temperature differential without the need for a compressor (see the paragraph bridging pages 4 and 5 of the present specification). Applicants disclosed the use of an adsorbent having particular water vapor adsorption isotherms in the heat adsorption pump of the claims. As recited in Claim 1, the adsorbent of the claimed invention can provide a change in water adsorption amount of 0.18 g/g or greater in a certain P/P_o range. As is evident from Drawing 3 of Hiroyuki, reproduced above, the silica gel of the prior art cannot provide such a change in the amount of water adsorption in the P/P_o range recited in the present claims.

The water adsorption isotherms for the adsorbents disclosed in Figure 15 of Komarneni are shown below for reference.

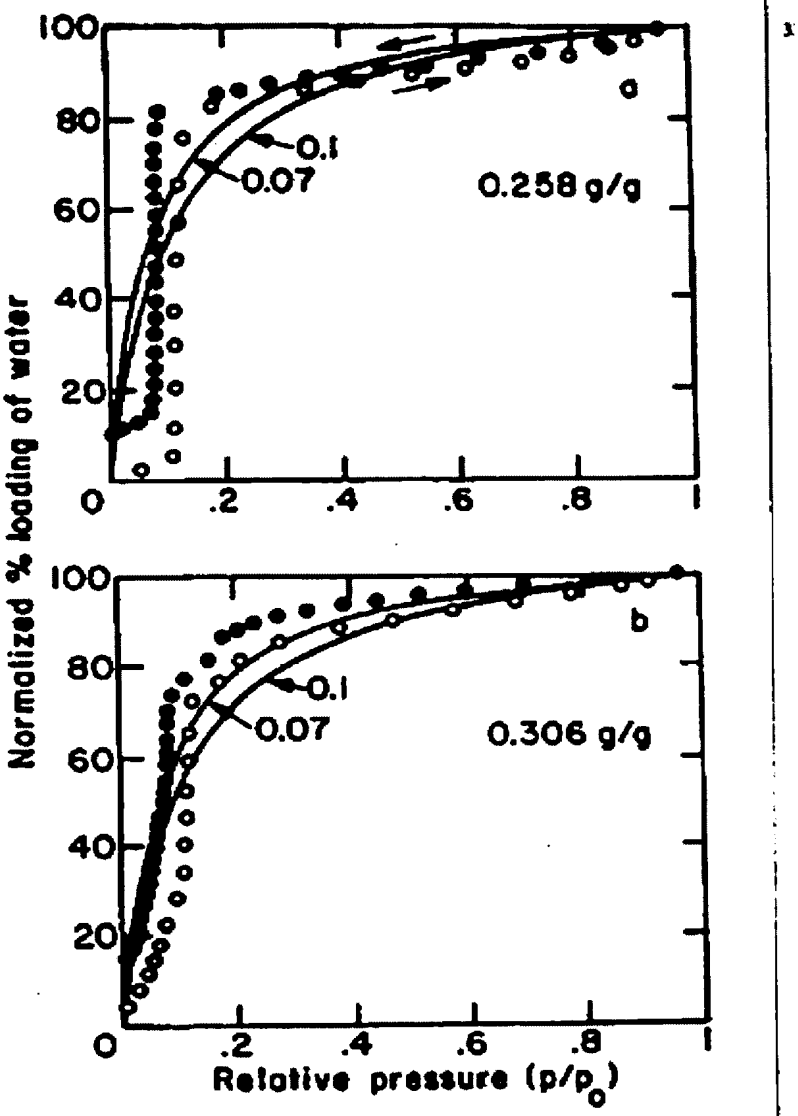


Figure 15. Water adsorption (O) and (●) desorption isotherms of (a) AlPO4-17 and (b) SAPO-17, calcined at 550°C.

It is readily evident from Figure 15 above that the water adsorption isotherms of Komarneni are substantially different in comparison to the water adsorption isotherms of the silica gel adsorbent of Hiroyuki. Where the Hiroyuki silica gel provides a nearly linear relationship between relative pressure (P/P_o) and the amount of adsorbate that is adsorbed, the Komarneni adsorbents exhibit substantially different water adsorption isotherm properties. In fact, the Komarneni adsorbents have a significant increase in water adsorption in the relative

pressure range of from about 0.05 to about 0.2 and a subsequent leveling off of water absorption thereafter.

Applicants submit that those of ordinary skill in the art would not be motivated to use the Komarneni adsorbent as a replacement for the Hiroyuki silica gel given the fact that the adsorbents have substantially different water adsorption isotherms. As stated above, the present claims require the adsorbent have particular water adsorption characteristics in the lower range of relative pressure (i.e., P/P_o).

As explained above, Hiroyuki discloses the use of compression/decompression in order to obtain particular water adsorption/desorption rates from the prior art silica gel adsorbent. If one were to use the adsorbents of Komarneni in the device of Hiroyuki the relative pressure performance of the Komarneni adsorbents would be disturbed because the compression/decompression cycles would change the relative pressure (P/P_o) behavior of the adsorbent. Such a change may lead to a disruption of the water adsorption isotherms shown in Figure 15 of Komarneni, reproduced above, which could then prohibit the Komarneni adsorbents from providing the water adsorption performance required by the present claims.

In this context, the combination of Hiroyuki and Komarneni does not make sense. The heat adsorption pump of Hiroyuki which includes a compressor would disrupt the water adsorption isotherms of the Komarneni adsorbent and thus prohibit the water adsorption performance required by the present claims.

Applicants draw the Office's attention to new dependent Claims 89-100 which require that the adsorption/desorption part of the presently claimed invention is directly connected to one or both of a condensation part and a vaporization part. Applicants submit that the new dependent claims are further patentable over the combination of Hiroyuki and Komarneni at least because Hiroyuki relies on the use of a compressor to achieve acceptable adsorption/desorption performance. The directly connected parts recited in the new

dependent claims exclude the presence of a compressor between, e.g., the adsorption/desorption part and the vaporization and/or condensation part, and thus are further patentable over the prior art relied on by the Office.

With respect to the other cited art, Applicants note that the "Atlas of Zeolite Framework Type" describes only the structure of a particular zeolite material and does not provide any guidance for its use in an adsorption heat pump as presently claimed. In the absence of any motivation to use the SAPO-17 material in an apparatus as presently claimed, the Office's reliance of this reference does not meet the criteria for a prima facie case of obviousness.

Likewise, with respect to the Office's reliance on Mizota (JP2001-239156) the cited reference discloses aluminosilicate adsorbents having certain average particle diameter characteristics (see paragraph [0030], Table 1 and the Examples), however, Claims 3 and 44 of the present application recite particular pore diameter values, not particle diameter values. The Office's reliance on Mizota is therefore incorrect and the rejections over the combination of the other cited art and Mizota should be withdrawn.

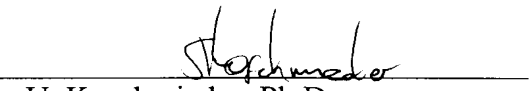
The Office further rejected the claims for obviousness-type double patenting over co-pending application 11/235,704. Present Claims 1-11, 20-21, 69-77 and 81-88 are drawn to an adsorption heat pump. Present Claims 41-52 and 61-5 are drawn to a method of using an adsorbent. In contrast the claims of the co-pending application are drawn to an "adsorbent." The Office has not provided any rational explanation how claims to an adsorbent can render obvious claims drawn to an adsorption heat pump or a method of using an adsorbent. Contrary to the Office's assertion, all of the limitations of the claims of the present application are not present in the claims of the co-pending application at least because the present claims and the claims of the co-pending application are drawn to different invention.

The rejection of the present claims for obviousness-type double patenting is therefore not supportable and should be withdrawn.

For the reasons discussed above in detail, Applicants submit that all now-pending claims are in condition for allowance. Applicants request the withdrawal of the rejection and the mailing of a Notice of Allowance acknowledging the patentability of the presently claimed subject matter.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon



Stefan U. Koschmieder, Ph.D.
Registration No. 50,238

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/07)

NFO:SUK\la